IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Wen Tong
Serial No. 10/792,127
Filed: 03/04/2004
Attorney Docket No. 7000-611
For: **COMMUNICATION CHANNEL OPTIMIZATION SYSTEMS AND METHODS IN MULTI- USER COMMUNICATION SYSTEMS**

Examiner: Kevin Michael Burd
Art Unit: 2611

Mail Stop Appeal Brief – Patents
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

A **REPLY BRIEF** is filed herewith in response to the Examiner's Answer mailed November 23, 2010. If any fees are required in association with this Reply Brief, the Director is hereby authorized to charge them to Deposit Account **14-1315**, and consider this a petition therefor.

A. Introduction

In response to the Examiner's Answer mailed November 23, 2010, Appellant respectfully maintains its position that the Patent Office has not shown where all the elements of the pending claims are either taught or suggested by the prior art or would have otherwise been obvious to one of ordinary skill in the art at the time of the invention.

In particular, Agrawal fails to disclose the steps of "receiving **a subset** of the weighted signals over **a sub-group of the plurality of communication channels**" and "decoding **the subset of the weighted signals** using inverses of the pre-coding signal weights **based on the channel state information associated with the sub-group of the plurality of communication channels**," at each of the receivers, as recited in independent claim 16.

Now, for the first time, the Patent Office sets forth the definition of the claim terms "subset" and "sub-group" that it used in making the rejection of claim 16. The definition of the terms used in the Patent Office's rejection is improper. Since the rejection is based on this improper definition of the claim terms, the rejection is also improper.

Appellant maintains all of the arguments set forth in the Appeal Brief filed September 7, 2010. In addition, Appellant responds to certain arguments raised in the Examiner's Answer mailed November 23, 2010. In particular, Appellant disagrees with the proposed definition of the claim terms "subset" and "sub-group."

B. Argument

The Patent Office has not shown where all the elements of the pending claims are shown in the prior art with sufficient particularity to sustain an anticipation or an obviousness rejection. In particular, the Patent Office has not shown where the prior art discloses each and every limitation in the independent claims. Under a proper reading of the claim terms, Agrawal fails to disclose the steps of "receiving **a subset** of the weighted signals over **a sub-group of the plurality of communication channels**" and "decoding **the subset of the weighted signals** using inverses of the pre-coding signal weights **based on the channel state information associated with the sub-group of the plurality of communication channels**," at each of the receivers, as recited in independent claim 16.

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The Patent Office states that Agrawal teaches receiving a subset of weighted signals over a sub-group of the plurality of communication signals "in that the subset and sub-group is a number equal to or less than the total number of weighted signals and the total number of communication channels." Examiner's Answer, p. 10. The Patent Office cites to a website, yourdictionary.com, as defining "subset" as "a mathematical set in which every element in the set is also contained in a larger set or in an equal set." *Id.* The Patent Office then argues that since "a subset is a mathematical set in which every element in the set is contained in an equal set, the set is the same as a subset, Agrawal discloses receiving a subset (all) of the weighted signals in the receiver. *Id.* at pp. 10-11. The Patent Office makes a similar argument with respect to the term "sub-group," asserting that since "a sub-group is a group that is a subset of a group, ... the group of communication channels is the same as a sub-group, [and] Agrawal discloses receiving a subset (all) of the weighted signals in the receiver over a sub-group (all) of the plurality of communication channels." *Id.* at p. 11.

Contrary to the assertion by the Patent Office, the Patent Office's definition of the terms "subset" and "sub-group" is not the ordinary and customary definition that one of ordinary skill in the art would use. This can be seen by the illogical nature of the statements by the Patent Office that "the set is the same as a subset" and "the group ... is the same as a sub-group." If Appellant has intended for the term "subset" to be read the same as a set and the term "sub-group" to be read the same as a group, Appellant would have used the terms "set" and "group" in the claims. Since Appellant did not use the terms "set" and "group" but instead used the terms "subset" and "sub-group" in the claims, Appellant clearly did not intend to claim "receiving a **set** of the weighted signals over a **group** of communication channels," as the Patent Office is improperly trying to read claim 16. Instead, Appellant claims "at each of the receivers: receiving **a subset of** the weighted signals over **a sub-group of** the plurality of communication channels; and decoding **the subset of** the weighted signals using inverses of the pre-coding signal weights based on the channel state information associated with **the sub-group of** the plurality of communication channels."

In addition, the interpretation of the Patent Office is inconsistent with the Specification. In the Specification, one embodiment recites "a method which includes receiving over **a sub-group of** communication channels **a subset of** signals to which pre-coding weights ... have been applied." Specification, p. 2, line 27 through p. 3, line 1 (emphasis added). Individual signals in

the received subset are separated by decoding through the use of inverses of the pre-coding signal weights based on channel state information associated with a sub-group of communication channels. Specification, p. 3, lines 1-10. This is in contrast to the embodiment described in the previous paragraph of the Specification, in which "a method of processing signals to be transmitted to receivers on communication channels is provided," wherein signal weights are applied "to the signals." Specification, page 2, lines 20-24. Note that in this embodiment, it is "the signals," not "a subset of signals" that are transmitted to the receivers. This shows that when Appellant means all of the signals rather than a subset of the signals, Appellant does not use the term "subset." When Appellant uses the term "a subset of signals," something different than all of the signals is the intended meaning. One of ordinary skill in the art reading the Specification would thus understand that the term "subset" is to be distinguished from the set of all of the signals.

Likewise, the term "sub-group" as used in the Specification clearly refers to something besides the entire group of all communication channels. In a discussion of decomposing large MIMO systems into sub-MIMO systems, signals are "transmitted via a respective antenna in each of a plurality of sub-groups, pairs in Fig. 2, of the antennas 32 to corresponding UEs 24, 26, 28." Specification, p. 8, lines 11-14; see also Figure 2. One of ordinary skill in the art reading this section of the Specification would understand that the term "sub-group" is to be distinguished from the group of all communication channels.

Further, when looking at the claim as a whole in context, it is clear that claim 16 is claiming something different than receiving all of the weighted signals over all of the communication channels. Claim 16 recites a method of processing signals to be transmitted to receivers on a plurality of communication channels, comprising:

determining pre-coding signal weights based on channel state information associated with the plurality of communication channels to provide proportional power allocation to the signals;

applying the pre-coding signal weights to the signals;

transmitting weighted signals to the receivers on the plurality of communication channels; and

at each of the receivers:

receiving a subset of the weighted signals over a sub-group of the plurality of communication channels; and

decoding the subset of the weighted signals using inverses of the pre-coding signal weights based on the channel state information associated with the sub-group of the plurality of communication channels.

If Appellant had intended to claim receiving the entire set of weighted signals over all of the communication channels, Appellant would have simply drafted claim 16 to say "transmitting weighted signals to the receivers on the plurality of communication channels" and "receiving the weighted signals at each of the receivers." Appellant did not do so. Instead, the plain wording of the claim recites that "**a subset of** the weighted signals" is received "over **a sub-group of** the plurality of communication signals." Thus, there needs to be a subset of weighted signals received over a sub-group of the plurality of communication channels in the claimed invention. Then, **the subset** is decoded using inverses of the pre-coding signal weights based on channel state information associated with **the sub-group**, not channel state information associated with the plurality of channels. The interpretation of the Patent Office renders much of the claim language superfluous since if a subset is read to be the same as a set and a sub-group is read to be the same as a group, the claim would basically say "receiving **[a subset of]** the weighted signals over **[a sub-group of]** the plurality of communication channels," where the bolded terms in the brackets are basically read out of the claim. This is contrary to the established claim interpretation law that "[a]ll words in a claim must be considered in judging the patentability of that claim against the prior art. *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). When considering all words in claim 16, Agrawal does not teach all of the limitations of claim 16; instead, as admitted by the Patent Office, Agrawal teaches that all of the signals are received over all the communication channels. Agrawal thus does not teach "receiving **a subset** of the weighted signals over **a sub-group of the plurality of communication channels**" and "decoding **the subset of the weighted signals** using inverses of the pre-coding signal weights **based on the channel state information associated with the sub-group of the plurality of communication channels**," at each of the receivers, as recited in independent claim 16.

Moreover, Appellant also notes that even in the yourdictionary.com definition of the term "subset," the example given (the even numbers are a subset of the whole numbers) is that a subset is something less than the whole set. Other online dictionaries have similar examples. For example, the Merriam-Webster on line dictionary, m-w.com, states: "The set {1, 2, 3} is a subset of the set {1, 2, 3, 4, 5}." See Exhibit A. Appellant also notes that m-w.com defines

"subset" as a "division" or "portion." *Id.* Likewise, dictionary.com defines "subset" as "a set that is part of a larger set" or "a set within a larger set." See Exhibit B. Further, with respect to the term "sub-group," even the dictionary used by the Patent Office, yourdictionary.com, defines "subgroup" as "a subdivision of a group" or a "subordinate group." The definition provided by the Patent Office also defines "sub-group" as "a distinct group **within** a group." These examples and definitions are consistent with the definition used by the Appellant in claim 16, as one of ordinary skill in the art would understand in light of the Specification and the whole of the claim language. One of ordinary skill in the art reading the Specification would understand that the proper definition of "subset" and "sub-group" is not the entire set or the entire group as alleged by the Patent Office.

When using the proper definition of the "subset" and "sub-group," Agrawal does not teach "receiving **a subset** of the weighted signals over **a sub-group of the plurality of communication channels**" and "decoding **the subset of the weighted signals** using inverses of the pre-coding signal weights **based on the channel state information associated with the sub-group of the plurality of communication channels**," at each of the receivers, as recited in independent claim 16, for the reasons set forth above and in the Appeal Brief filed September 7, 2010.

Claim 13 is an independent claim that recites limitations similar to those recited in claim 16 and thus is patentable over Agrawal for at least the same reasons set forth above with respect to claim 16. Moreover, the Patent Office has not pointed with particularity to any portion of Agrawal that discloses "wherein the signals comprise respective groups of signals to be transmitted to the receivers, wherein determining the pre-coding signal weights further comprises determining the pre-coding signal weights to separate the respective groups of signals," as recited in claim 13. Agrawal is silent as to separating the respective groups of signals by determining the pre-coding signal weights. Claim 13 is therefore patentable for this additional reason.

With respect to the other claims, Appellant maintains all of the arguments set forth in the Appeal Brief filed September 7, 2010.

C. Conclusion

As set forth above and in the Appeal Brief filed September 7, 2010, none of the cited references, either alone or in combination, disclose all of the elements of the pending claims. As such, Appellant requests that the Board reverse the Patent Office and instruct the Patent Office to allow the claims.

Respectfully submitted,

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Date: January 24, 2011
Attorney Docket: 7000-611

EXHIBIT A

Word Games   Word of the Day   New Words & Slang   Video

Merriam-Webster
m-w.com

subset

subset

sub·set   *noun*   \ˈsəb-ˌset\

Definition of SUBSET

1 : a set each of whose elements is an element of an inclusive set

2 : DIVISION, PORTION <a *subset* of our community>

☞ See *subset* defined for English-language learners »

Examples of SUBSET

The set {1,2,3} is a *subset* of the set {1,2,3,4,5}.

Only a small *subset* of the patients in the study experienced these side effects.

First Known Use of SUBSET

1902

Rhymes with SUBSET

abet, aigrette, all wet, backset, baguette, banquette,
barbette, barquette, barrette, beget, beset, blanquette,
boneset, brevet, briquette...
[+] more

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Next Word in the Dictionary: subshrub
Previous Word in the Dictionary: subservient
All Words Near: subset
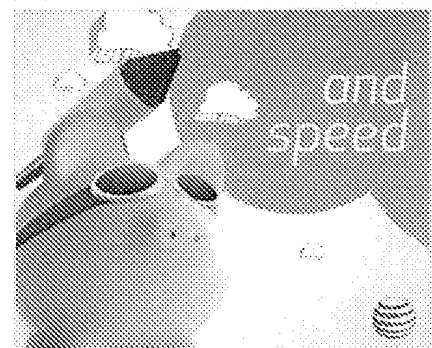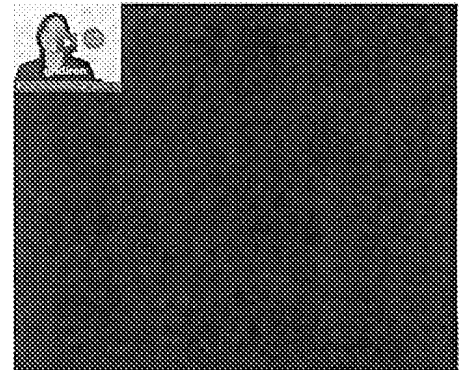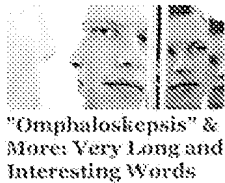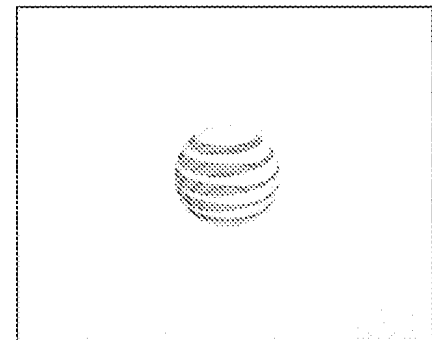
EXHIBIT B

| Dictionary | Thesaurus | Flashcards beta | Quotes | Encyclopedia | Translator | | Login | Regi |
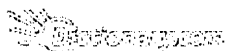
subset [Search]

Did you know: You look for a Web page and it says "Error 404 Not Found." What do the numbers mean?

Nearby Words

▲

subservient
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subsessile
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subsextuple
subshaft

▼

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subset - 4 dictionary results

jugum   affable
forfend   egregious

sub·set ◀))

[suhb-set] [?] Show IPA

–noun

1. a set that is a part of a larger set.
2. *Mathematics* . a set consisting of elements of a given set that can be the same as the given set or smaller.

Origin:
1900–05; sub- + set

Dictionary.com Unabridged
Based on the Random House Dictionary, © Random House, Inc. 2011
Cite This Source | Link To subset

Style guide
Confusing words
Word of the Day

Free tools
Blog
Games

World English Dictionary

subset ('sʌb,sɛt) [?]

— n
1. *maths*
   a. a set the members of which are all members of some given class *A is a subset of B* is usually written A⊆B
   b. **proper subset** A⊂B one that is strictly contained within a larger class and excludes some of its members
2. a set within a larger set

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2009 © William Collins Sons & Co. Ltd. 1979, 1986 © HarperCollins
Publishers 1998, 2000, 2003, 2005, 2006, 2007, 2009
Cite This Source

Word Origin & History

subset
"subordinate set," 1902, from sub- + set (n.).
Online Etymology Dictionary, © 2010 Douglas Harper
Cite This Source

Science Dictionary

subset ◀))(sŭb′sĕt′) Pronunciation Key
A set whose members are all contained in another set. The set of positive integers, for example, is a subset of the set of integers.

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